

Lewis (M. J.)

THE OPHTHALMOSCOPE AS AN AID TO
MEDICAL DIAGNOSIS.

By

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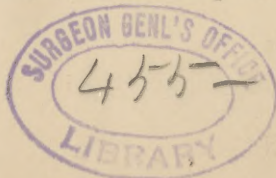
ASSISTANT PHYSICIAN TO THE CHILDREN'S HOSPITAL.

[Read July 4, 1877.]

AT the Pennsylvania Hospital, during the last three years, several very interesting cases showing pathological changes in the eye-ground have occurred in the service of Dr. James H. Hutchinson, who kindly places the notes which were taken at the time, at my disposal. I have studied the cases with him, during the first year as resident physician to the hospital, and during the remainder of the time as his clinical clerk. The assistance of Dr. W. F. Norris has nearly always been obtained in making the ophthalmoscopic examinations, and the post-mortem examinations have been made by Dr. Morris Longstreth.

In the Philadelphia Medical Times for May 8, 1875, Dr. Hutchinson published a case of supposed Ménière's disease, the notes of which, briefly summed up, are as follows:—

CASE I.—Catharine C., aged 42, an unmarried seamstress, first noticed pain at the top of her head in the autumn of 1873; this was thought, at the time, to be due to nasal catarrh. In the following June she began to lose her hearing, and, in the course of a few weeks, became almost absolutely deaf; the later symptoms were tinnitus aurium, unsteadiness of gait, pains in the limbs accompanied by



impairment of sensation, vertigo, and occasional vomiting. In October, 1874, she was admitted into the hospital, and then a tendency to fall forwards and to the right, and almost constant vertigo while erect, were noticed. Headache was a very marked symptom, and there was also nausea. No history of syphilis could be obtained, nor was this disease suspected. An ophthalmoscopic examination, made soon after the patient's admission, showed the optic disks to be prominent and dull-red in color, with fulness and tortuosity of the retinal veins, which plainly dipped over the edge of the disk, and marked striation of the retina, but no hemorrhagic spots. O. S. fundus $+ \frac{1}{60}$, summit of disk $+ \frac{1}{16}$; O. D. fundus $+ \frac{1}{40}$, summit of disk $+ \frac{1}{25}$.

Upon this case Dr. Hutchinson remarks as follows: "If this pathological condition [alluding to Ménière's disease] is really present, it is not sufficient by itself to explain the choking of the disk, which I believe is caused by some interference with the flow of blood within the cranial cavity;" and he concludes by saying, "At all events there is in the case a lesion different from that which is generally supposed to exist in Ménière's disease, which I think could only have been discovered by the ophthalmoscope."

In March, 1875, the patient was discharged somewhat improved, but in April, 1876, again returned to the hospital, where she died on June 1, of the same year, under the care of Dr. J. Aitken Meigs, by whose permission I publish the remainder of the notes. The patient was deafer than on her previous admission, and this was particularly marked in the left ear; she also had headache, nausea, and vomiting. Her urine at first was normal, but subsequently showed a trace of albumen; no casts, however, could be discovered. Later symptoms were great dizziness, so that she fell upon the least attempt to walk, and an increase of the old pain in the back and limbs. Shortly before the fatal event took place, she lost completely the power of motion in her legs, while sensation was not entirely destroyed. At no time was there

any facial paralysis, nor did she complain of impairment of vision, although she wore powerful convex glasses.

The autopsy revealed two sarcomatous masses, one situated over the internal auditory meatus of each temporal bone, and that on the left entirely closing the jugular foramen on that side; the foramen on the opposite side was twice its normal size. There was marked ventricular dropsy, with consequent bulging of the infundibulum. The chiasm was softened, apparently as a consequence of pressure. Upon removing the posterior segments of the eyeballs, together with the optic nerves, the nerve-sheaths were seen to be considerably distended just behind the sclerotic, and the intra-cranial portion of the left optic nerve was flattened and somewhat softened. The left optic papilla was prominent, particularly upon the nasal side, and two arteries were seen curving over its edge; while in the right eye the papilla was prominent only upon the nasal side, and the vessels were much more obscured, some being irregularly enlarged.

This case shows particularly the value of an ophthalmoscopic examination, for, until this had been made, the original diagnosis had satisfied all those who saw the patient; and, in addition, it refutes the statement, made by some physicians, that a diagnosis of intra-cranial disease can never be made with the aid of the ophthalmoscope, unless it can be equally made without the employment of that instrument.

I report the next case on account of the conditions discovered upon the post-mortem table, no examination of the eyes having been made during life.

CASE II.—Charles S., colored, æt. 20, single, waiter. His family history was good; he was intemperate, but denied all venereal taint. Since the year 1872, the patient had had occasional pain in the shoulders, and in the following year he began to cough and to expectorate muco-purulent sputa.

In August, 1876, he was admitted to the hospital, suffering from slight, irregular chills, and intermittent pain on the right side of his head, limited to the area supplied by the trifacial nerve; during these attacks he complained of dimness of vision. He was naturally thought to be suffering from malaria, and was treated with large doses of quinine, under the use of which he rapidly improved, and was discharged in two weeks, cured of his neuralgia, but with dulness at the apex of the right lung, and slight cough.

In the latter part of October the patient exposed himself to cold, and was immediately taken sick; nausea, vomiting, constipation, œdema of legs, and distension of the abdomen appeared, and the cough became much worse. On his second admission, for he returned to the hospital, there was marked ascites, with pain in the hepatic region; and examination of the lungs showed dulness over the whole of the right lung, and slight dulness at the left apex, with subcrepitant rales generally diffused. There were no cerebral symptoms, and there was no return of the neuralgia. The diagnosis of tubercular peritonitis was made. The patient died Nov. 14, 1876, and, at the autopsy, in addition to marked tuberculosis of the abdominal and thoracic viscera, three tubercular masses, each about as large as a cherry, were found in the brain; one in the posterior part of the right hemisphere, near the cortex, a second in the left hemisphere over the posterior horn of the ventricle, and a third in the right lobe of the cerebellum towards the inferior surface. There was no meningitis, but the ventricles contained considerable fluid. Upon removing the posterior halves of the eyeballs, marked choking of the optic disks was discovered, and the optic nerve-sheaths were distended slightly, near the sclerotic. (This last observation was made after the eyes had been for some time in a solution of chromic acid.)

Had an ophthalmoscopic examination been made in this case on the patient's first admission, it is most probable that choked disk would have been recognized,

and attention would then have been called to the condition of the brain; as it was, this was overlooked, for the neuralgia was the only symptom that pointed to intra-cranial disease.

CASE III.—In this connection I will refer to the case of Sarah M., reported by Dr. Hutchinson to the College, a few months ago; it is recorded as a "Case of malignant disease of the retro-peritoneal and mesenteric glands, rib, and vertebræ, etc." (*vide supra*, page 55), but there was also a cancerous mass the size of half a hen's egg, projecting into the cranial cavity from the left middle fossa, and making a deep depression in the anterior part of the left middle lobe; there were no cerebral symptoms whatever, and the ophthalmoscope showed normal optic disks. At the autopsy, no fluid was found in the ventricles, and the optic nerve sheaths were not distended. The case is particularly interesting in this respect as it tends to prove that choked disk may be caused by effusion into the intracranial cavities.

CASE IV.—In a case of abscess of the brain, reported by Dr. Hutchinson to the Pathological Society last winter, ophthalmoscopic examination revealed slight choking of the right papilla, with white patches—the evidences of old hemorrhages—on the nasal side of the disk. On account of symblepharon the left eye could not be examined. The autopsy revealed an old abscess situated in the right optic thalamus, and marked dropsy of the ventricles. Upon removing the posterior parts of the eyeballs, together with their nerves, the papillæ were found choked, particularly the left; the optic nerve-trunks on both sides appeared normal, and "especially was it noted that no distension or abnormal looseness of the external sheath existed at or close to the sclerotic."

In the following cases no autopsies were made, the patients either recovering and leaving the hospital, or, if they died, their friends refusing an examination.

CASE V.—John B., æt. 21; single; porter; was admitted April 17, 1877. No hereditary taint was discoverable; the patient was moderately intemperate, but denied having had syphilis. During the summer of 1876, he had had a severe attack of "bronchitis," which had been accompanied by occasional, blood-stained expectoration, but he had recovered towards winter. Three weeks before his admission he had noticed anorexia, conjunctivitis, and photophobia, and, two weeks later, headache, pain in the extremities, and epistaxis appeared. On admission there was violent headache, marked irregularity of the heart's action, and constipation; but no lung complications were discoverable, and the urine was normal. Some of the symptoms pointed to typhoid fever, and in fact for a short time the patient was thought to be suffering from that disease, but, upon making an ophthalmoscopic examination, slight prominence of the papillæ (the outlines of which were indistinct), and marked fulness of the veins, were discovered. Attention was then more particularly directed to the cerebral symptoms, and, in the course of two days, pain in the back, shooting into the extremities, and slight retraction of the head, occurred, and it then became evident that the case was one of meningitis, probably cerebrospinal. The further progress of the case verified this diagnosis. Hiccough, opisthotonos, delirium, marked hyperæsthesia, subsultus, retention of urine, and strabismus appeared, about in the order mentioned. Subsequent examination of the lungs merely revealed a little harshness of the respiration at the left apex. Vomiting only occurred twice. The patient died comatose on the thirteenth day after admission, but shortly before death an examination of the eyes by Dr. Norris revealed "choking of the left disk with haziness of the retina, and œdema of the right disk." No autopsy was allowed.

In the following case the ophthalmoscope only served to verify the diagnosis previously made.

CASE VI.—Peter R., æt. 35; married; waterman; Irish; was admitted Jan. 10, 1874. Six months previously he had been sunstruck, but from this he had apparently recovered, and he considered himself in good health until a few weeks before applying to the hospital, when he began to suffer from headache, malaise, and vomiting. About January 1, he became delirious, and, soon after this, incontinence of feces made its appearance. On admission, the patient was almost comatose; there was marked rigidity of all his muscles, and forced movement apparently caused pain; there was also by this time incontinence of urine, but upon examination the latter was found to be normal. There was no cough. A short time after this the patient became rational, and was able to speak, but did not complain of headache. The diagnosis of "meningitis following sunstroke" was made. Examination of the eye-grounds revealed hazy, swollen disks, and distended and tortuous veins. The patient was given iodide of potassium, but gradually sank, and died February 17, 1877, the "Cheyne-Stokes" character of respiration having become marked towards the close of life. In this case also no autopsy was allowed.

CASE VII.—In the Philadelphia Medical Times for May, 1875, Dr. Hutchinson reported a case of cerebro-spinal meningitis, in which the cerebral symptoms were so slight that it was doubtful whether the meninges of the brain were implicated or not, or in fact whether the patient was not merely hysterical, as at one time she jumped out of bed to see a passing parade; but upon examination with the ophthalmoscope, marked choking of the disks, together with retinal hemorrhages, was discovered, which made the diagnosis of cerebro-spinal meningitis almost a certainty when the other symptoms were taken also into consideration. The further progress of the case showed the correctness of the diagnosis. The patient recovered perfectly, all traces of the choking eventually disappearing.

It is not in well-marked cases of meningitis, where there is no doubt about the diagnosis, that the oph-

thalamoscope is most valuable, but in the obscure forms, particularly in the tubercular meningitis of children, and in meningitis complicating the exanthemata, where the outset is so often insidious. In metastatic meningitis, Huguenin considers choked disk as one of the most reliable of all signs. Ziemssen states that the stiffness of the neck may be entirely wanting in cases of cerebro-spinal meningitis, and Paoulucci even reports a case, verified by autopsy, in which there were no cerebral symptoms whatever; but neither of these authors reports the condition of the eye-ground.

The majority of intra-cranial growths are syphilitic, and energetic treatment, if commenced in time, will in the majority of cases effect a cure; so that but few of these find their way to the post-mortem table. The two following cases were undoubtedly of this nature:—

CASE VIII.—Henry C., æt. 41; single; nurse; Irish; was admitted January 2, 1875. When 20 years of age he contracted chancres, and again eight years later. In 1868 he was treated in the Pennsylvania Hospital for venereal warts, and since then has served as an assistant nurse in the hospital. He has had frequent attacks of facial erysipelas. Five weeks before admission into the Medical Ward, he noticed vertigo and unsteadiness of gait, and a few weeks later the vision of his right eye began to fail; after this slight paralysis of the right side of the face appeared, accompanied by marked sluggishness of mind, but not by headache. The patient then had a violent convulsion, which was followed by unconsciousness for about ten minutes; upon recovering, he had intense occipital headache, ptosis of the left lid, increased paralysis of the right side of the face, tinnitus aurium, and deafness. There was no hemiplegia nor

aphasia, and his urine was non-albuminous. Ophthalmoscopic examination showed choking of the optic disks. Under large doses of iodide of potassium he almost entirely recovered, and in about one month the choking of the disks had given place to slight atrophy.

CASE IX.—Simon M., æt. 35; single; sailor; German; was admitted September 10, 1875. About the year 1868, the patient had several attacks of unconsciousness, which from his description resembled *petit-mal*; but from these he recovered, and shortly afterwards contracted gonorrhœa, and probably a chancre, which was followed by phagedenic ulceration. He was treated very energetically for this in Shanghae, and was severely ptyalized; his left arm then became exceedingly hyperæsthetic, and finally rigid and slightly atrophied. In the winter of 1873, violent pain of the left side of the head appeared, together with several nodes upon the temporal and parietal bones; dimness of vision and vertigo were also present. From this time until his admission, the patient had been exceedingly intemperate, and on that account was unable to give further information as to his previous history, having been almost constantly intoxicated.

On admission, there was found paralysis of the left side of the face, total anæsthesia of the conjunctiva on that side, tinnitus in the left ear, loss of sense of taste on the left side of the tongue, and impairment of the sense of smell. The left arm and leg were very slightly paralyzed. There was diplopia, and ophthalmoscopic examination revealed choking and haziness of the inner half of each disk, with commencing atrophy of the outer halves. Under the use of large doses of iodide of potassium, he improved greatly, and was discharged in April, 1876.

In the following case, the diagnosis was never positively made out, but the probability is that there was syphilitic disease of the spinal cord, with extension of inflammation to the brain.

CASE X.—John R., æt. 36; widower; bricklayer; Pennsylvanian; was admitted February 28, 1877. His mother had died of apoplexy, but the rest of his family history was good. He had been a very moderate drinker. During the war he had served as a sharpshooter, and his sight was uncommonly good. Four years before admission he had contracted a chancre, but this he said had not been followed by bubo nor by any evidence of constitutional infection. In December, 1876, he began to suffer from headache, fever, and pain in the left side upon full inspiration; but with this he had no cough. The headache lasted four weeks, was always worse at nights, and was at times excruciating. After this he had violent shooting pain in the left thigh and hip, and then his knees, left elbow, and shoulder became stiff and painful.

On admission, the pains persisted, and a very sensitive spot was discovered over the dorsal vertebræ; slight atrophy of the left deltoid muscle was also detected. There was a slight apex-systolic murmur. The urine was normal. At first the patient was thought to be suffering from chronic rheumatism, and was treated accordingly, but one month after admission, no improvement having occurred, an ophthalmoscopic examination was made with the following result: In the right eye, the disk was swollen upon the nasal side, and its outlines were indistinct; the veins were very full and tortuous. In the left eye, the disk was more swollen, being seen with $+ \frac{1}{33}$, and the surrounding retina was hazy; the veins were still fuller than in the other eye. He was given large doses of iodide of potassium, and in the course of ten days was able to walk quite well, whereas before he could scarcely leave his bed. In May, just before he was discharged, a re-examination of his eyes revealed greater indistinctness of the disks, and greater fulness of the veins; there was also noticed for the first time slight internal strabismus of the left eye. During the patient's stay in hospital, he had no headache, nor other symptoms pointing to intra-cranial disease, except the condition of the eye-ground and the sub-

sequent strabismus; so that in this case the ophthalmoscope was of considerable service.

In the following case it is probable that the diagnosis of simple epilepsy would have been made, had not the ophthalmoscope been employed, and indeed this diagnosis had been made by the physician who sent the patient to the hospital.

CASE XI.—William H., colored, æt. 26; laborer; was admitted December 14, 1874. He considered himself to have been perfectly well until the year 1873, except for an attack of gonorrhœa the year before; he denied, however, ever having had a chancre. In the spring of 1873 he had had an epileptiform seizure, and this had been repeated once or twice every week until the date of his admission to the hospital. He had at no time had an aura, headache, or vertigo. On admission there were found no paralytic symptoms, and no general or local anasarca. Ophthalmoscopic examination revealed marked choking of the disks, which were deep red in color; the veins were swollen and tortuous, and there were several hemorrhagic spots upon the retinæ, which latter were quite striated; shortly afterwards slight insufficiency of the right internal rectus was detected. Examination of the urine showed a slight amount of albumen, but at first no casts could be detected, though later a few granular and hyaline casts were found. During the month in which he remained in the hospital, the patient had three severe convulsions, which came on suddenly without the least warning, lasted about ten minutes, and apparently affected every muscle in the body; almost immediately after the seizures he would feel as well as usual. This patient unfortunately was lost sight of; it is probable that there was some intra-cranial lesion, possibly syphilitic, in addition to the Bright's disease, although it is possible that the latter condition gave rise to the choking, as it sometimes, although very rarely, does so. The lesion of the eye-ground in ordinary epilepsy, according

to Albridge (West Riding Asylum Reports, vol. i.), is merely hyperæmia of the optic disks and retinae, and in some few cases active congestion; but in these cases this abnormal condition subsides somewhat in the intervals between the paroxysms. In syphilitic epilepsy, on the other hand, according to Fournier, there is nearly always "optic neuritis." The presence of the latter condition in the foregoing case is therefore in favor of the diagnosis of syphilis, while, on the contrary, the statement of Charcot that syphilitic epilepsy is most always hemiplegic in nature, is against it. The diagnosis therefore must remain somewhat doubtful.

A second case of albuminuria, in which the ophthalmoscope revealed changes closely resembling those found in cases of intra-cranial disease, also occurred in the hospital, and is worthy of record.

CASE XII.—Jacob E., *æt.* 35 (?); married; steward; was admitted March 3, 1877. He had been a moderate drinker, but denied all venereal taint. In 1870 he had had a violent attack of renal colic, and a second one in 1874; in the interval he had felt moderately well, but had noticed that he was obliged to micturate very frequently. Soon after the second attack of colic he had observed slight œdema of his face and legs, and this symptom continued until his death. He never noticed any sandy deposit or calculus in his urine. On admission, the patient's legs were slightly œdematous, and he complained of violent headache, but had no impairment of vision. His urine contained a moderate amount of albumen and pale granular casts; the amount passed in twenty-four hours measured six pints. After remaining in the hospital for over two weeks, without any untoward symptom, the patient went out on a pass, and returned suffering from marked dyspnoea and cough; examination of the lungs revealed numerous moist, bronchitic râles. Ophthalmoscopic examination showed, in the right eye, the "disk bluish-gray, and wanting in capillarity, the upper part much swollen, looking as if it had been choked, and its outlines obscured; the fibre-layer

of retina opaque, and the retinal vessels diminished in calibre; and in the left eye the disk whitish, more swollen than that in the right eye, its outlines obscure, and the fibre-layer of the retina hazy; no retinal hemorrhages nor choroidal changes in either eye." The patient's condition became rapidly worse, and he died in convulsions three days after the exposure. The autopsy revealed marked granular degeneration of the kidneys and hypertrophy of the heart. The head unfortunately was not examined.

Several other interesting cases have occurred in the hospital: these, however, I will not report, for fear of wearying my hearers, but will proceed at once to make a few remarks as to the manner of causation of choked disk, and as to its value as a diagnostic sign.

The questions, What precise value is to be placed upon the ophthalmoscopic appearances in the diagnosis of intra-cranial diseases? and, What are the causes of the pathological conditions so discovered? have not yet been definitely answered, although there has been no want of diligent research in this direction by competent observers. Those who first used the ophthalmoscope, in cases of cerebral disease, were much more positive in their statements as to the differential diagnosis between the pathological changes discovered in the eye-ground, and their relative value as diagnostic signs, than subsequent observers; thus, Dr. Clifford Allbutt defines choked disk or ischæmia papillæ as the signal of intra-cranial tension, and neuritis as the signal of intra-cranial irritation, and states that these can be differentiated. Dr. Broadbent inclines in the same direction, but is held back by the doubts of Dr. Hughlings Jackson and Mr. Jonathan Hutchinson. MM. Raymond and Bouchut believe too that these lesions are essentially different.

Acknowledging for the sake of argument the difference between the conditions, a second difficulty arises, for inflammatory and obstructive changes in the disk are frequently associated, either being the consequence of the other; both conditions therefore being present at the same time, it would manifestly be impossible by mere ophthalmoscopic examination to state which was the primary trouble, though this may be said not to be an objection to the theory, but rather a proof of the immature state of our knowledge of this subject. Mr. R. Brudenell Carter, in his work on Diseases of the Eye, remarks that he has never been able to satisfy himself of the value of any ophthalmoscopic sign as showing the presence of inflammation, or the preponderance of inflammatory over obstructive changes. The consequence is that the majority of the later observers do not pretend to recognize which condition is the primary one, or even to recognize one from the other, but speak of optic neuritis and choked disk as synonymous terms. This is quite unfortunate, and, quoting Dr. Broadbent, "till this question is decided we cannot so much as pass the threshold of the inquiry as to the mode of production of optic changes in diseases of the brain." It is, however, positively determined that the ophthalmoscope is a very valuable aid in the study of cerebral disease, and is frequently the means of making a correct diagnosis.

According to Allbutt, "it is sufficient at present to say that the occurrence of papillary ischæmia or of optic neuritis, in any person, ought to awaken the gravest suspicion of cerebral disorder, and that the occurrence of simple atrophy should suggest great

watchfulness; the precise degree of meaning to be attached by the physician to optic neuritis cannot, however, be determined until a certain number of cases of optic neuritis without cerebral changes have been traced to the post-mortem table." Although this sentence was written in 1871, it still applies with full force, and will apply until the physician and the ophthalmologist work in concert. In the *Lancet*, for May 12, 1877, Dr. Jackson, in an interesting paper, calls attention to the fact that Mr. Couper has found that, in some cases of hypermetropia, the optic disks, in consequence of overuse of the eyes, become reddened and even swollen. The redness and swelling are sometimes so marked that this comparatively unimportant condition, remediable by spectacles, is occasionally mistaken for, and treated as, slight neuritis depending on cerebral disease.

In many cases of intra-cranial tumor, where amaurosis is a prominent symptom, atrophy of the disk is found upon examination, and thus has been looked upon by some as being the most common pathological condition of the eye-ground associated with brain tumor; if, however, an early examination is made, choked disk will frequently be found to be the precursor of this atrophic change. Jaccoud, in his "*Pathologie Interne*," 1877, alludes to 89 cases of brain tumor reported by Lebert and Friedreich; in these, there was amaurosis in 66, a percentage of 74.15. In the 91 cases in Annuske's list, in which the condition of the sight was noticed, amaurosis occurred in 73, a percentage of 80.21. As will be seen later, this percentage is not as high as the percentage of changes in the eye-ground in intra-cranial disease;

choked disk may, therefore, be overlooked if the ophthalmoscope is only used in the cases attended with impairment of vision. According to Wadsworth, "atrophy of the disk in all these cases is to be regarded as the result of, and therefore as having the same significance as, neuritis." As regards the frequency with which choked disk and atrophy occur in connection with intra-cranial tumors, Annuske, in Graefe's Archives, and Reich, in a Russian medical journal, report 92 cases verified by autopsy, in which "optic neuritis, or *atrophia-ex-neuritide*," was found in 88 of the cases, being 95.65 per cent. In looking over the medical journals from the year 1874, the date of Reich's report, to the present time, I have been able only to collect 31 cases in which ophthalmoscopic examinations have been made, and in which the diagnosis has been verified after death; to these I add the 3 cases observed in the Pennsylvania Hospital, making 34 in all. Choking of the disk, or atrophy, occurred in 27 of these; in 3 there was redness of the disk, or dilatation of the retinal veins; and in 4 the disks were healthy; adding these to the cases previously mentioned, we have a total of 126, in 115 of which choking or atrophy occurred, a percentage of 91.26; but if the 3 cases in which "redness of the disk or dilatation of the vessels" was noted, be added and considered as cases of commencing choking of the disk, the percentage rises to 93.65. I annex the list to this paper. Annuske believes that these changes will be almost always, if not always, found, and thinks that the statements that intra-cranial tumors often do not give rise to optic neuritis, are the result of imperfect or insufficient observations.

It is now, however, positively determined that these exceptions do occasionally occur. (See Case III.)

It is not only in cases of brain tumor that the ophthalmoscope reveals morbid changes, but also in any condition that produces increased intra-cranial tension; this is particularly the case in the various forms of meningitis with ventricular dropsy; and, indeed, according to the statistics at present obtainable, the percentage of changes in the eye-ground in this condition is higher than in brain tumor. Thus in the 90 cases of meningitis reported by Bouchut and Heinzel, neuritis, or atrophy, was found in 94.33 per cent. of the cases. Dr. Hock (*Archives of Ophthalmology and Otology*, vol. v. No. 1) differs from the majority of observers as to the appearances of the fundus of the eye in meningitis, and states that, in his experience with cases of basilar meningitis in children, he has found the retina to be the part principally affected, and the optic disk rarely if ever at all swollen; he, however, draws no conclusions. Bartalot (*London Medical Record*, Aug. 15, 1876) arrives at very much the same opinion after observing carefully 24 cases. According to the former observer, infants show a greater predisposition than adults to the alterations of the optic nerve in the course of cerebral disease.

The second question, viz., What are the causes of choked disk? is not as easily answered as the first. According to Wadsworth (*British Medical Journal*, Nov. 5, 1874), "the direct progression of inflammation from the base of the brain along the optic nerve to the eye, has been anatomically proven only in rare instances;" and Pagenstecher (*London Ophthalmic*

Hospital Reports, vol. vii.) states that he has never been able to satisfy himself that the morbid process has originated in this manner, and that the more he has employed himself in researches of this kind, the more doubtful has he become as to this mode of origination of the changes met with in the disk; he strengthens his statement by reporting carefully seven cases, in four of which the "structure of the optic nerve, so far as it was examined, was perfectly normal," and in three other cases, "along with complete atrophy of the disk, there was also atrophy of the optic nerves all through the portions which had been removed for examination." These changes in the nerve, he therefore looks upon as being a consequence and not a cause of the choking.

The mechanical theory finds the most supporters at the present day, although the precise method of the origination of the obstruction to the return of blood from the eye, is still a matter of dispute. Von Graefe explains it by an increased pressure within the cranium retarding the return of blood by pressure upon the cavernous sinus, direct or indirect, which thus causes a venous stasis within the eyeball. Michel believes that the pressure on the sinus is brought about by ventricular effusion distending the infundibulum, and, as a consequence, interfering with the circulation in the cavernous sinus. An objection to these views arises in the fact that the sinus has quite rigid walls, and that the amount of pressure necessary to compress it would have to be far greater than that which is ordinarily found in intra-cranial disease; and, besides this, Seseman has shown that a free communication exists between the facial and the ophthal-

mic veins, which is sufficient to remove all stasis of the retinal veins, even should the sinus be occluded.

Schwalbe, by experiments, has proved that it is easy to distend the permeable space existing between the two sheaths of the optic nerve, from the arachnoid cavity, and that the fluid collects around the insertion of the optic nerves; further experiments by Manz and Schmidt show that the fluid finds its way into both optic nerves, although only one arachnoid cavity be injected. Axel-Key states further that the ventricles of the brain are in connection with the sub-arachnoid space, and that this latter space connects with a second space between the inner sheath of the nerve and the nerve itself.

In Dr. W. F. Norris's interesting paper on Optic Neuritis, read before the American Ophthalmological Society at Newport, July, 1874, after some allusions to the inflammatory changes being almost limited to the region of the lamina cribrosa, is the statement: "we have found, however, that although most intense at that point and in its vicinity they were not limited to it, but extended backward throughout the orbital portion of the optic nerve. This we can readily account for, when we consider that Schwalbe, as well as Axel-Key and Retzius, have demonstrated that fluids injected into the subvaginal space readily pass into the lymph spaces in the interior of the nerve, which surround and separate the individual nerve-fibres, thus producing throughout its length œdema and nutritive hyperplasia." From these statements it is seen that an excess of fluid in any of the cavities of the brain will distend the sheaths of the optic nerve, and thus compress the retinal vein at its emergence, and before

it joins the ophthalmic vein, besides interfering with the nutrition of the optic nerve itself, which, as is well known, is supplied directly from the cerebral circulation, and not from the vessels of the eyeball.

Hitzig states that during life, under normal circumstances, the subdural space contains cerebro-spinal fluid, so that it is even possible for intra-cranial tension to distend the optic nerve-sheaths by the displacement of this fluid, even though no abnormal amount is present. In four out of Pagenstecher's seven cases, this distension was very marked, and in two others it was present, though to a much less degree; but he considers that this effusion is due to local causes. Manz has discovered this so often that he considers that it must be an almost invariable occurrence in intra-cranial disease. Dr. Norris, in the paper before mentioned, reports two cases in which there was marked dilatation of the nerve-sheaths, coinciding with ventricular dropsy. In Cases I. and II., recorded in this paper, this condition was present; in Case III. it was absent, but here there was no ventricular effusion, and no choking of the disk; in Case IV., although there was choking, the notes say that there was no sheath dilatation. Abadie (*L'Union Médical*, Sept. 24, 1874) says, on the other hand, that he has rarely found this condition present.

It is stated that choked disk is most frequently found in association with growths occupying the cerebellum and the posterior parts of the brain; the probable explanation of this fact is to be found in the greater likelihood of interference with the flow of blood in the sinuses and *venæ Galeni*, by growths in this position, and, as a necessary consequence, of effu-

sion into the cavities of the brain. Benedict considers that an irritation conveyed by the sympathetic to the optic disk, causing an increased vascularity of the parts, is the main factor in producing choked disk, and alludes to his experiments in this direction with the constant current. In this, Pagenstecher follows him. Abadie calls attention to the experiments made by Claude-Bernard, in which section of the trifacial, behind the Casserian ganglion, caused ulceration of the cornea, conjunctiva, and tongue, although upon examination of the nerve trunks they were found to be perfectly normal; and suggests that the changes in the optic disk may be explained in an analogous manner. These last two theories however have very few followers.

In some cases of Bright's disease, a condition in no wise distinguishable from choked disk is found, as in Cases XI. and XII. I do not refer to the well-known retinitis albuminurica. In only one such case, however, can I find the record of a post-mortem examination, and in that case the brain is said to have been normal. It is reported by Mr. R. Brudenell Carter. Much valuable information can be obtained by examining the eye-ground in cases of Bright's disease. The discovery of pronounced retinitis, or of marked retinal hemorrhages, should lead one to make a grave prognosis as regards length of life. Mr. Bader (Guy's Hospital Reports, 3d series, vol. xii.) remarks, upon the subject of retinal hemorrhage, "we look upon the latter as a general warning as regards the state of the patient's bloodvessels;" and Mr. Carter has found that in his experience the termination of such

cases, among hospital patients, has been comparatively rapidly fatal.

In this connection the subject of cerebral hemorrhage naturally arises, and as the diseased condition of the arteries, which is generally the cause of the hemorrhage, is frequently associated with renal disease, the condition of the retinal arteries and of the retina may be of great diagnostic value. In looking over the Pennsylvania Hospital case-books for the past three years, I find that every case of cerebral hemorrhage was associated with contracted kidneys and hypertrophied heart. Unfortunately, however, no ophthalmoscopic examinations were made before death, nor were the eyes examined after that event took place.

While believing that the ophthalmoscopic signs are of great value in forming a correct diagnosis of cerebral disease, I do not think that they have the transcending significance which Bouchut, in his recent publications, attributes to them; but I believe that they should always be considered in connection with the other symptoms, and that the physician who does not use the ophthalmoscope in these cases is neglectful of one of the most important aids in the elucidation of a difficult subject.

TABLE OF THIRTY-FOUR CASES OF INTRA-CRANIAL TUMOR, IN WHICH OPHTHALMOSCOPIC EXAMINATION WAS RESORTED TO AS A MEANS OF DIAGNOSIS.

	Observer.	Character and position.	Condition of ventricles, etc.	Condition of vision.	Condition of optic nerves, etc.	Remarks.
1	Hughlings Jackson, Med Times and Gaz., Jan. 3, 1874.	Tuberculous mass in pons Varolii.	Ventricles and arachnoid space distended with fluid.	"Diplopia."	"Redness of disk."	
2	Id.: Ibid., Feb. 7, 1874.	Medullary glioma in pons Varolii.	Ventricles distended with fluid.	Not mentioned.	Double optic neuritis.	
3	Id.: Ibid., Feb. 7, 1874.	Sarcoma; surface of right hemisphere.	Not mentioned.	Not mentioned.	Double optic neuritis.	
4	Id.: Ibid., Feb. 28, 1874.	Right hemisphere.	Not mentioned.	Not mentioned.	Optic neuritis, left eye.	Optic nerve-sheaths distended.
5	Id.: Ibid., Aug. 1, 1874.	Gumma; middle lobe of cerebellum.	Ventricles distended with fluid.	"Failure of sight."	Double optic neuritis.	
6	Id.: Ibid., Oct. 24, 1874.	Ant. convolution and both lobes of cerebellum.	Ventricles distended with fluid.	"Sight good."	Atrophy.	
7	Id.: Ibid., May 1, 1875.	Glioma; middle lobe of cerebellum.	Not mentioned.	Blindness.	Double optic neuritis.	
8	Id.: Brit. Med. Journ., March 24, 1877.	Middle lobe of cerebellum.	Not mentioned.	Not mentioned.	Double optic neuritis.	
9	Broadbent, Ibid., Feb. 28, 1874.	Gumma; Fissure of Sylvius.	Not mentioned.	Impairment of vision.	Double optic neuritis.	
10	J. Shingleton Smith, Ibid., June 6, 1874.	Glioma; right lobe of cerebellum.	Not mentioned.	Sight good.	Double optic neuritis.	
11	Ramskill, Med. Times and Gaz., May 23, 1874.	Glioma; left hemisphere, corpus striatum, and optic thalamus.	Not mentioned.	Impairment of vision.	Commencing optic neuritis.	
12	Russell, Ibid., May 16, 1874.	Cancer; ant. lobe of right hemisphere.	Not mentioned.	"No diplopia."	"Optic disks healthy; veins too full."	
13	Headland, Ibid., May 30, 1874.	Sarcoma of both hemispheres.	Not mentioned.	Impairment of vision.	Double optic neuritis.	
14	Buzzard, Ibid., July 11, 1874.	Tubercle of cerebellum and medulla oblongata.	Not mentioned.	Sight good.	Double optic neuritis.	
15	Raymond, Gazette Méd., Juin, 1874.	Cerebellum.	Not mentioned.	Impairment of vision.	Atrophy.	
16	Bull, Philad'a Med. Times, May 15, 1875.	Middle lobe of cerebellum.	Not mentioned.	Not mentioned.	Optic disks normal.	
17	Dreschfield, Brit. Med. Jour., April 3, 1875.	Cancer; at base.	Not mentioned.	Sight completely lost.	Optic disks normal.	
18	Russell, Ibid., March 27, 1875.	Gumma; at vertex, median line.	Not mentioned.	Not mentioned.	Double optic neuritis.	
19	Duffin, Ibid., June 24, 1876.	Glioma of corpora quadrigemina.	Ventricles distended with fluid.	Sight lost.	Double optic neuritis.	Venæ Galeni compressed.
20	Dowse, Path. Society, Lond., 1876.	Gumma; torcular Herophili.	Not mentioned.	Sight lost.	Double optic neuritis.	
21	Id.: Ibid., 1876.	Glio-sarcoma; ant. wall of corpus callosum.	Not mentioned.	Sight good.	"Disks hazy."	
22	Gowers, Ibid., 1876.	Gliomatous tumor of left cerebral hemisphere.	Not mentioned.	Not mentioned.	Double optic neuritis.	

	Observer.	Character and position.	Condition of ventricles, etc.	Condition of vision.	Condition of optic nerves, etc.	Remarks.
23	Hulke, Med. Times and Gaz., Jan. 20, 1877.	Sarcoma; ant. and middle fossa.	Not mentioned.	"Confusion of sight."	Double optic neuritis.	Cavernous sinus destroyed.
24	Fox, Lancet, Jan. 6, 1877.	Glioma; left lobe of cerebellum.	Ventricles distended with fluid.	Impairment of vision.	O. D. optic neuritis. O. S. atrophy.	Chiasma and nerve trunks normal.
25	Pooley, Arch. Ophthal. and Otol., vol. v., No. 2.	Gumma; left post. lobe of cerebellum.	Right ventricle greatly distended.	Impairment of vision.	O. S. choked disk.	
26	Habershon, Guy's Hosp. Reports, 3d S. vol. xx., 1875.	Inflammatory growth in right post. lobe of cerebrum.	Left ventricles dilated.	Impairment of vision.	Congested disk with hemorrhagic spots.	
27	Id.: Ibid., 1875.	Tubercular masses in left side of pons and cerebellum.	Not mentioned.	Impairment of vision.	Optic neuritis.	
28	Id.: Ibid., 1875.	Sero-cyst of cerebellum, median line.	Ventricles much dilated.	Total blindness.	Choked disk.	
29	Norris, Amer. Ophth. Society, July, 1874.	Sarcoma of cerebellum.	Ventricles much dilated.	Impairment of vision.	Choked disk.	Optic nerve-sheaths distended.
30	Dentan, Arch. Gén. de Méd., Dec. 1876.	Glio-sarcoma; front left frontal convolution.	Ventricles much dilated.	Not mentioned.	"Retinal vessels somewhat dilated."	
31	Kohts, Virchow's Archiv, Bd. lxvii.	Post. part of corpora quadrigemina.	Ventricles much dilated.	Not mentioned.	Double optic neuritis.	
32	Hutchinson, Present Paper, No. I.	Fibro-sarcoma of both middle fossæ.	Ventricles much dilated.	Not mentioned.	Choked disks.	Optic nerve-sheaths distended; left jugular foramen closed.
33	Id.: Ibid., No. II.	Tubercle; right and left hemispheres and right lobe of cerebellum.	Small amount of serum in ventricles.	Occasional dimness of vision.	Choked disks (found post-mortem).	Optic nerve-sheaths distended.
34	Id.: Ibid., No. III.	Cancer; right middle fossa.	No distension of ventricles.	Not mentioned.	Disks normal.	

